

The Swedish Fisheries

IN NATURE of April 20 you ask for an explanation of the difference in the figures of Dr. Oscar Dickson and Dr. Lundberg relating to the Swedish fisheries.

1. You mention that Dr. Lundberg, in the "Notizen über die Schwedischen Fischereien," 1880, valued the herring fisheries of Sweden at 5,000,000 marks (3,547,303, p. 27), but you forget that Lundberg's book only refers to the "Ostsee und Sussvasser Fischereien," and Dr. Dickson only speaks of the west coast or North Sea fisheries.

2. About the "millions of barrels representing millions of pounds sterling," the Swedish North Sea Herring Fisheries statistics value the barrel herring *now* only at 1 to 2 shillings in the first (fisherman's) hands. And you will notice that the millions of barrels mentioned by Dr. Oscar Dickson in the *Scotsman*, refer to a former period, nearly a century ago, not to the present period, commenced 1877.

Pyphis, Sweden, May 3

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THE OLDEST EGYPTIAN TOMBS AND TENANTS

ALTHOUGH the existence of mankind in the dawn of civilisation at the Stone age, and using Palæolithic tools is distinctly proved in Northern Africa and Algeria, the specimens discovered on the soil of Egypt are not so unequivocally Palæolithic, although those published by Sir J. Lubbock approach the type. Of the Neolithic stone weapons, numerous examples have been found, some undoubtedly in use at the time of the eleventh and twelfth dynasty, others probably descending to the eighteenth and nineteenth dynasties. The indications, however, of sepulchres of the Palæolithic period are absolutely wanting on the soil of Egypt, and except the stone huts in the Arabian Peninsula, belonging to the more ancient period, there are no remains of contemporary construction.

In the graves around the oldest pyramids Neolithic remains are occasionally found, and there can be no doubt that flint weapons were extensively used at the oldest pyramidal period, which, however, was one of copper and bronze, copper and even iron objects having been found in the air passages of the great Pyramid, and indications of the use of the hollow bronze drill in the stone sarcophagi of the same epoch. The pyramids were arranged chequer-wise in groups, and each separate site belonged to a different dynasty, the kings and other royal personages being inhumed in them, while around the pyramid of each site were arranged the tombs of the courtiers and officers of the court. The arrangement of these tombs differs at the respective sites. At Sakkarah they are arranged in rectangular groups of streets, and the same arrangement prevails at Gizeh. At Abusir the last undulations of the step-shaped hills which crown the pyramids are occupied by some tombs scattered about of the time of the fourth and fifth dynasty. At Dashour there are also some tombs of a very early and unknown period, and at Meidum, tombs of the third dynasty. All these tombs bear a general resemblance to each other, and pass by the general Arab name of *mastabas*, "counters," or "beds." At first sight they look like the pedestals of pyramids, or truncated pyramids, being of rectangular shape, with sloping sides; they are, however, not square, but rectangular, and the angle of the sides is so great that the walls, if produced upwards, would rise to 600 feet, an impossible height for such a construction. Consequently they are not of the class of pyramids, but only show the Egyptian preference for converging lines, instead of purely parallel or rectangular forms; the short sides also in some instances are step-shaped, the layers of stone are squared and laid in horizontal courses, and not polygonal masses. These rectangular masses of masonry or brick-work, the details of which will be subsequently described, did not contain the sepulchral chamber, for that is always found in the solid rock beneath, the access to which was by a

rectangular shaft or well, down which the coffin and mummy were lowered by ropes; the mass of masonry above had only in it the sepulchral chamber and the cell for the sepulchral statue. The general "cemetery," with its street of tombs, was called in Egyptian *kher* or *khet*; the individual tombs bore the general name of *maha* "sepulchres," which was applicable to any class of tomb, whether those of the kings or used by the inhabitants of the town or city. The term *mer* was applied to any tombs which had pyramidal construction, as those made of brick with pyramidal tops cut out of the flank of the hill at the time of the eleventh dynasty at the Drah Abu'l Neggah, in the western quarter of Thebes; but the term applied to the syringes or hollowed passages and tunnelled tombs at Gournah and elsewhere is *asi*, a word applied to a plant, perhaps a "reed," but also meaning a chamber, and this word was used to express the so-called mastaba, or quadrilateral sepulchre of the early dynasties. The great necropolis of Sakkarah is supposed to be that of the ancient Ka-Kam, the city of the Black Bull, known to the Greeks under the name of Cochoe, and the pyramid there to have been named *Ap*, the "elevation" or "Mount," and the pyramid was step-shaped, made of unbaked brick, probably when first built in seven stages.

The mastabas were the mausolea of the richer and more important personages of the court hierarchy and Egyptian bureaucracy, for the poor and slaves were not buried with any consideration; they were hustled into superficial graves about three feet deep beneath the soil, and at this distant period of time are found only as skeletons, with no linen wraps remaining or other traces of emblems, and must therefore be regarded as the oldest and most primitive examples of Egyptian interment, and their bodies were unprovided with coffins. Occasionally, perhaps, some of the least poor, or slaves of extraordinary merit, had rectangular vaulted chambers, constructed of brick-work, vaulted and covered with a white coating; in the interior of these rude graves are found small vases or cups of coarse pottery or calcareous stone or alabaster, but uninscribed. These graves recall to mind those of the later Roman period, although the Memphian ones belong to a period long anterior.

The mastabas vary in size and dimension, but their average or normal dimensions are nearly fifty yards long, twelve yards wide, and thirty deep. The chief of these mastabas is the Mastabat-il-Pharaoun, which recent discoveries show to have been the sepulchre of Unas of the fifth dynasty, who was not buried in a pyramid. The mastabas are said to be peculiar to Gizeh, and not to be found elsewhere, and a long interval of civilisation must have preceded the construction of these tombs, as they show a considerable knowledge of architecture by their regular and geometric construction, while the square blocks and regular layers, each vertical joint being overlapped by a square stone, evidence considerable technical experience in the art of masonry. The other mastabas are made of similar masses of brick-work, and the bricks are of two kinds, those of the oldest mastabas, made of rectangular yellow bricks, composed of sand, pebbles, and some Nile mud, their dimensions being 22×11×7 of a metre, and black bricks made of alluvial soil and straw, larger in size, being 38×18×14 of a metre; these bricks are not older than the middle of the fourth dynasty, while the others are as old as the second line. The black bricks continue till the time of the Romans, and both kinds are sun-dried, no burnt bricks, with the exception of the conical stamped bricks, found at the tombs of the Drah-Ahi'l-Neggah, having been employed in constructions till the age of the Cæsars.

In the masses of brick-work or masonry which stood above the soil over the sepulchral chamber, hewn out of the solid rocks beneath, were constructed the mortuary chapel, for the performance of masses or liturgies to the

dead, which, however, must have been of a simpler nature than those in use at a later period. In all these mastabas which, as a rule, face northwards, generally towards the north-east angle, is a kind of stele or sepulchral tablet of limestone, some times like facade, composed of separate pieces, and having two square pillars or columns in front, without capitals or abaci, forming a kind of entrance hall. This part of the mastaba is rarely on the south, never on the west, and the ceiling is always continuous, sometimes slightly vaulted by the stones supporting one another. The tablet is often like a door, with jambs, lintels, and hieroglyphics; sometime the facade or stele has a kind of false door with large figures of the occupant of the tomb and his wife at the sides of the false door, with a semicylindrical tambour above the door and a kind of cornice above that, with a sepulchral dedication to Anubis, never to Osiris, and representations of the person for whom the sepulchre was made, at a repast or some other diversion, as the fowling represented on the mastaba at Meidum. On the portion of the soil covering the serdab or inner niche and the well by which the sarcophagus and its mummy were lowered, are found little vases filled with a coating containing inside the trace of the water with which they were filled. The interior chapel or *asi* was either single, or had more than one chamber, and the walls of these were covered with pictures and inscriptions engraved in intaglio and brightly coloured, still vivid after 6000 years, but no furniture itself or offerings are discovered in the rooms, which have been long open to the spoiler. The inscriptions refer to the calendar and festivals throughout the year, the titles of the deceased, adoration to Anubis, and tables of food, or *menus* in use at the period; and the gourmands of the Egyptian aristocracy fared sumptuously every day out of well-filled flesh-pots and jars of wine and beer. The paintings on the walls depict the chase, the farm, the industrial household, the amusement of dances by professional women, games, and other diversions, and were no doubt intended to recal to the spirit of the dead his favourite occupations and his former wealth. Such solaces were reserved for the rich; the poor reposed after death about as indifferently as during life.

When constructed of masonry, the walls of the chapel in the mastaba were often made of rubble revetted, and at the end, at the foot of the false door is often found the stone altar of libations, sometimes with two small obelisks engraved only on one face; at other times, instead of obelisks, two supports in the shape of altars. The stele or sepulchral tablet was at the earliest period made in shape of a facade, but often quite blank, a mere white slab. It is not till after the sixth dynasty that these tombstones were rounded at the top, like those of the present day. When the chapel was ornamented, the tombstones are often blank; when the walls of the chapel—the *asi*—were unadorned, the tablets were often inscribed. In the most ancient tombs the tombstones are often built up of pieces and are inscribed with hieroglyphics of an early and rude type. The art is bad, and the inscriptions are not in regular lines, but dispersed over the area; the hieroglyphics themselves are often peculiar, executed with more elaborate detail than at the later period of the middle Empire. The object of these early inscriptions is to record the name and titles of the departed, and it is remarkable that at this period persons had the *ran-aa*, or "great name," and the *ran-nets*, or "little name." A tomb, for example, of the second dynasty, at Sakkarah, was made for a man whose great name was Sekarkhabau, or "Sochari's rising amongst spirits," whose small name was Hothes—that of a rat or some small animal; and his wife's great name was Atherhotep, and her little name Teps; and this as early as the second dynasty. These chapels now have no doors, if they ever had, and except the vases found strewed here and there on the floor, the

other objects which may have been deposited there have entirely disappeared. Behind the wall, on the south side more often than the north, and on the north more often than the west, was a secret niche, which the Arabs call the *serdab*, occasionally communicating with the chamber by a square orifice. In this niche was deposited a statue of the deceased. In this statue was supposed to reside his *ka*, or spirit, a kind of manes, or ghost, which inhabited the tomb, went in and out of the sepulchre and Hades, and to which was attached a priest, who performed the liturgies or litanies, in certain ways, and with peculiar rites. In the earlier inscriptions this *ka* is not mentioned, but at the close of the twelfth dynasty, all the benefits conferred by deities on the deceased were said to be due to his *ka*. It was in this chapel and to this image that the ancestral worship was paid, and the *ka*, which was a kind of *idolon* of the dead, was supposed to receive the same satisfaction as the dead himself. Most of the statues in the museums of Europe at the time of the fourth and sixth dynasties, came from the serdab of the sepulchre of the period. They were portraits of the dead, and sometimes represented him holding the tools or other marks of his profession. The whole of the mastaba, or chapel, and its mass was superposed on the real sepulchral chamber beneath, which it covered. The descent to this was by a rectangular well or shaft, from six feet six inches, to nearly ten feet square, and this cell passed through the masonry or platform of the mastaba, and then through the living roots of the foundation, and was made of large blocks; it was down this well that the sarcophagus was lowered to the chamber, by a shaft from thirty to seventy-five feet deep. Hence, at the base of the shaft, a short passage led to the rectangular chamber, which was well built, but has only once been found uncemented, and in it was placed the sarcophagus of granite, or calcareous stone, and the mummy, or body. The cell itself was carefully blocked up with rubbish to prevent access to the chamber, and the mouth of it is generally found either in the long axis of the tomb, or else behind the tombstone. The sarcophagus of this period has no resemblance to the later cases in shape of the human form, generally made of wood, which prevailed from the eleventh dynasty, or about 1800 B.C., to the first century, A.D., but are rectangular chests with vaulted cover, with projections at the edges. The bodies found in these chests are distinguished by the absence of linen or wraps in which they may have been embalmed, and bones of the skeleton are only discovered generally, of a brown colour, with a faint odour of bitumen, which is the more remarkable as the mummies found in the pyramid had both linen and indications of bitumen.

Of course, the ethnological question here arises, to what race of men did these old Egyptians of the period of the second and subsequent dynasties belong; they have been referred to the Caucasian races, and some of the skulls show a high intellectual development, even frontal sutures occurring. Their colour is painted in the sculptures, and on their statues, either red or copper, the female yellow, but their profile is not Semitic, and shows, as at the period of their history, traces of African blood. Some of the servants are dolicocephalic, and are supposed to be the indigenous race, similar to the Libyans of Northern Africa, who, however, at a later period, are classed amongst the white races.

It is, however, in vain to look for the origin of Egyptian civilisation, either in Aethiopia or Nubia, or south of Egypt, or on the northern coast of Africa, which lies to the west, for there is no evidence of races in these parts having ever attained a nascent civilisation, such as the Egyptian might have started from. Recent discoveries in Southern Mesopotamia, however, show a similar civilisation, almost, if not as old as the Egyptian, with a form of written language developing from the ideographic to that of the conventional type, into which the original

picture invariably declines. The physical type, too, of the Babylonian statues from Tel-lo, approaches the Caucasian rather than the Semitic type.

ON SOME RECENT AMERICAN MATHEMATICAL TEXT-BOOKS

IN NATURE (vol. xvi. p. 21) we drew attention to a "shaking" that was taking place among the "dry bones" of the mathematical text-books in common use in American colleges and schools, and upon the analysis we then furnished of a few works before us we ventured to predict a speedy awakening of mathematical life. Our prognostications have been quickly fulfilled, and we now propose to submit an account of five recent books, some of which are quite fitted to hold their own, in our opinion, with English text-books on the same subjects.

"The Elements of the Integral Calculus, with a Key to the Solution of Differential Equations," by Dr. W. E. Byerly (Boston, 1881), is a sequel to the volume on the "Differential Calculus," previously noticed by us. This work is founded upon Bertrand's classical treatise, supplemented by free use of the allied treatises by Todhunter, Boole, and Benjamin Peirce. The opening chapters give a clear exposition of the use of symbols of operation and of imaginaries. So early an introduction to these subjects is novel to us in this connection, but it shows how the subject of quaternions is coming to the front, and the passage from the subjects of these chapters to quaternions is but a short one. The main portion of the book calls for no special comment. In Chapter XIV. we have a treatment of *mean value and probability*, founded upon the able contributions of Prof. M. W. Crofton, F.R.S., to Mr. Williamson's treatise.

The novelty of the book is Chapter XV., entitled "Key to the Solution of Differential Equations." This key is based upon Boole's work, and is a collection of concise, practical rules for the solution of these equations. An idea of its form will be best conveyed to some persons by saying that it resembles the analytical key so frequently prefixed now-a-days to handbooks of the British (and other) flora. By a series of references we run the particular equation to ground. Thus, taking the example, $(1+x)ydx + (1-y)xdy = 0$, it is a single equation, this sends us to a number; it involves ordinary derivatives, this advances us a stage; it contains two variables, is of the first order, and finally of the first degree. The upshot is we arrive at the form $Xdx + Ydy = 0$, under which head we learn how to solve the equation. Under this last head, as throughout the book, are given numerous illustrative exercises for practice.

Dr. A. S. Hardy's "Elements of Quaternions" (Boston, 1881) is intended to meet the wants of beginners. In addition to the works of Sir William R. Hamilton and Prof. Tait, the author has consulted the memoirs or works of Bellavitis ("Calcolo dei Quaternione" and the "Exposition de la Méthode des Équipollences" in Laisant's translation); Hoüel's "Quantités Complexes;" Argand's "Essai" (1806); Laisant's "Applications mécaniques du Calcul des Quaternions," and one or two other books and papers in the *American Journal of Mathematics*, vol. i. p. 379. It is a good introduction to such a work as Prof. Tait's, the originality and conciseness of which, however, Dr. Hardy thinks to be "beyond the time and need of the beginner."

Our next book is "An Elementary Treatise on Mensuration," by G. B. Halsted (Boston, 1881). Dr. Halsted is already known to mathematicians here as the author of a very full "Bibliography of Hyper-space and non-Euclidean Geometry," in the *American Journal of Mathematics*, vol. i., Nos. 3, 4. This treatise on Metrical Geometry is "the outcome of work on the subject while teaching it to large classes," so that it is no hastily prepared book, but has been founded on actual teaching

experience. The methods have a German "smell," and this is justified by the author's residence, we presume as a student, at Berlin. There are eight chapters: (1) on the measurement of lines (triangles, method of limits, rectification of the circle; (2) on the measurement of angles; (3) of plane areas; (4) of surfaces (he uses *Mantel* for lateral surfaces, also *Stereon* and *Steradian* in connection with a solid angle); (5) of volumes (*Quader* is new for De Morgan's "right solid"). In these last two chapters the solids discussed are the prism, cylinder, pyramid, cone, and sphere; an article is also devoted to Pappus's theorem. (6) The applicability of the prismoidal formula; (7) approximative methods, as Weddle's method; (8) on the mass-centre, with a paragraph on the mass-centre of an octahedron, which gives Clifford's construction (see *Proc. Lond. Math. Soc.*, vol. ix. p. 28). There are numerous exercises, these we have not tested. The book is most effectively "got up," the printing, figures, and paper being, to our mind, excellent.

Our last two books are by Prof. Simon Newcomb, so well known as the author of "Popular Astronomy." The first, "Algebra for Schools and Colleges" (New York, 1881), has already reached its second edition. It is a capital book; indeed we are disposed to rank it as the best manual on the subject that we have seen for school purposes. It is divided into two portions, "the first adapted to well-prepared beginners, and comprising about what is commonly required for admission to colleges, and the second designed for the more advanced general student." We shall perhaps best serve the end we have in view in noticing this work by giving an analysis of the author's preface. The principles of construction are (1) that an idea cannot be fully grasped by the youthful mind unless it is presented in a concrete form. Hence numerical examples of nearly all algebraic operations and theorems are given—so numbers are preferred to literal symbols in many cases. The relations of positive and negative algebraic quantities are represented by lines and directions at the very earliest stage. "Should it appear to any one that we thus detract from the generality of algebraic quantities, it is sufficient to reply that the system is the same which mathematicians use to assist their conceptions of advanced algebra, and without which they would never have been able to grasp the complicated relations of imaginary quantities." Principle (2) is that all mathematical conceptions require time to become engrafted upon the mind, and the longer, the abstruser they are. "It is from a failure to take account of this fact, rather than from any inherent defect in the minds of our youth, that we are to attribute the backward state of mathematical instruction in this country, as compared with the continent of Europe." Prof. Newcomb considers the true method of meeting this difficulty is to adopt the French and German plan of teaching algebra in a broader way, and of introducing the more advanced conceptions at the earliest practicable period in the course. A third feature is the minute subdivision of each subject, and the exercising the pupil on the details before combining them into a whole. This remark especially applies to the solution of the exercises. Some subjects have been omitted (as G.C.D. of polynomials, square roots of binomial surds, and Sturm's theorem), as they have no application "in the usual course of mathematical study, nor advance the student's conception of algebra," and in studying them there is a waste of power. "Thoroughness" has been our author's aim rather than "multiplicity of subjects." There are other points of interest in this preface which show that the writer is a very experienced teacher, and which we commend to the consideration of teachers here, but we must pass on to indicate the contents of the two parts.

Part I. embraces algebraic language and operations, equations, ratios and proportion, powers and roots, equations (quadratic), progressions, seven books in all.